http://www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/ballasts.htm
Last updated on Wednesday, December 29, 2010

Polychlorinated Biphenyls (PCBs)

Proper Maintenance, Removal, and Disposal of PCB-Containing Fluorescent Light Ballasts

A Guide for School Administrators and Maintenance Personnel

TSCA Information Hotline

For additional information call

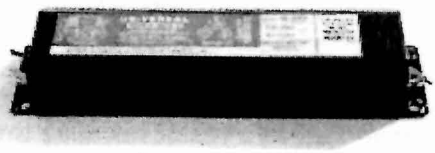
202-554-1404

Highlights

Get more information on TSCA disposal requirements for fluorescent light ballasts (PDF) (1 pg, 8K, about PDF).

Introduction

The purpose of this website is to provide information to school administrators and maintenance personnel on the risks posed by polychlorinated biphenyls (PCBs) in light ballasts, how to properly handle and dispose of these items, and how to properly retrofit the lighting fixtures in your school to remove potential PCB hazards.



An intact ballast from a typical pre-1979 fluorescent light fixture.

If they remain in use over an extended period, failed or leaking fluorescent light ballasts may result in unsafe levels of PCBs in the air children breathe. Such ballasts must be immediately removed and disposed of in accordance with federal law. While intact PCB-containing light ballasts pose no immediate health threat, they are likely to fail over time. The U.S. Environmental Protection Agency (EPA) recommends that these older lighting ballasts should be removed to prevent accidental exposure of students, teachers, and other school personnel to PCBs through fires or leaks. Removal of PCB-containing light fixtures, as part of lighting upgrades or a stand-alone project, is an investment that pays off with long-term benefits to students, school staff, the community, and the environment.

Why Should I Be Concerned about PCBs in My School?

Many schools in the United States built before 1979 have light ballasts containing PCBs. The PCBs are contained within the light ballasts' capacitors and in the ballasts' potting material. Until the late 1970s, PCBs were commonly used as insulators in electrical equipment because they have high tolerance to heat, do not burn easily, and are non-explosive.

This ballast sparked a fire at a southern California school in 1999.

Congress banned the manufacture of PCBs in the United States in 1977 because of their toxic effects. In 1979, EPA banned the processing or use of PCBs, except in totally enclosed equipment. However, a large number of fluorescent light ballasts that were installed prior to these bans may contain PCBs and may still be in use in U.S. schools.

Intact, operational ballasts where PCBs remain in the ballasts and potting material may not pose a health risk or environmental hazard. However, as they age, the ballasts degrade. Depending on the number of operating hours, the typical life expectancy of a magnetic fluorescent light ballast is between 10 and 15 years. The failure rate prior to the end of the useful life of ballasts is about ten percent. After this typical life expectancy, ballast failure rates increase significantly. All of the pre-1979 ballasts in lighting fixtures that are still in use are now far beyond this life expectancy, increasing the risk of leaks or even fires, which would pose a health and environmental hazard. A PCB containing ballast may also be lacking in thermal overload protection, increasing the possibility of fires or leaks. The hazard can be worsened by mishandling by personnel who are unaware of the presence of PCBs in the lighting ballasts. A ballast that has been damaged or mishandled in such an incident can increase exposure of students and school personnel to PCBs.

A recent pilot study of three schools in New York City found that many light ballasts in these schools contained PCBs and had also failed, causing the PCBs to leak and contributing to increased levels in the air that school children breathe. EPA has also seen evidence of leaking PCBs in light ballasts in schools in Oregon, North Dakota, and Massachusetts.

What Are the Health Effects of PCBs?

Most of us have very low levels of PCBs in our bodies from long term exposure that have built up over time. Although PCBs are highly toxic, few of us suffer any known health consequences as a result because the levels in our bodies are very low. However, high levels of exposure can be dangerous. Skin conditions, such as acne and rashes, can occur after exposure to large amounts of PCBs in the workplace or from accidental poisonings. PCBs cause some types of cancer in laboratory animals and high levels of exposure may cause cancer in people. Studies in humans provide supportive evidence for these health effects. In addition, studies of pregnant women and their children suggest a link between high levels of PCBs in a mother's body and some effect on her child's birth weight, short-term memory, and learning.

Because of the risks posed by PCBs, they were banned from production by Congress in 1977. However, we all continue to be exposed to PCBs, through eating food and from breathing indoor air and coming into skin contact with dirt and dust. The generally small amounts of PCBs to which we are exposed each day build up over time in our bodies. These small daily increments accumulate over years leading to a long term "body burden" of PCBs.

It is this accumulated body burden of PCBs that is important in understanding potential health effects, rather than individual higher or lower daily doses. Learn more about the health effects of PCBs.

The most likely way that people may become exposed to PCBs from light ballasts is through breathing PCB-contaminated air or touching PCB oil or PCB-contaminated materials after a ballast leak or fire.

In order to provide guidance on levels of concern regarding chemicals in the environment, EPA develops reference doses (RfD) and concentrations (RfC). A reference dose is an estimate of a daily oral exposure level that the human population, including sensitive subpopulations, that if one were exposed to for a lifetime, would not cause appreciable risk to human health. EPA's RfD for the one type of PCB, Aroclor 1254, is 0.02 micrograms per kilogram per day. Based on this RfD and exposure factors such as typical air inhalation rates and the period of time spent at school, EPA has estimated the PCB levels of 0.2 - 0.3 micrograms per cubic meter of air in schools would not result in harmful effects to human health even if one were exposed over a lifetime. This is a conservative, health protective estimate. EPA's goal is not to have people exposed above this RfD level.

Exceeding this level does not mean that adverse effects will necessarily occur. However, as exposure levels become higher, EPA has less confidence that the exposures will not result in adverse effects.

Do My Fluorescent Light Ballasts Contain PCBs?

- Ballasts manufactured through 1979 may contain PCBs.
- Ballasts manufactured between 1979 and 1998 that do not contain PCBs should be labeled "**No PCBs**." If a ballast is not labeled "**No PCBs**," it is best to *assume* it contains PCBs.

If the ballast does contain PCBs, they are located inside the small capacitor or in the surrounding potting material. There would be approximately 1 to 1½ ounces of PCBs in the capacitor itself and lower levels in the potting compound, a black, tar-like substance that encapsulates the internal electrical components. Leaks of PCBs from ballasts typically take two forms: a clear to yellow oily liquid, the PCB oil itself, or the liquefied potting material. If the ballast fails or overheats, the capacitor may break open and both its oil and the potting material may be released from the fixture. The capacitor does not always leak when the ballast fails, but measures should be taken to limit or avoid personal exposure in all cases.

Should the Light Ballasts in My School Be Removed?

- *Your school was built before 1979.*
- *Your school has not had a complete lighting retrofit since 1979.*

If these statements apply to your school, then the answer is yes, your light ballasts probably contain PCBs and should be removed. Any building built before 1979 is likely to have PCB-containing ballasts if it has not undergone a complete lighting retrofit (all light fixtures in the school were upgraded) after 1979. Also, some PCB-containing light ballasts that were manufactured before the 1979 ban were used in some fluorescent light fixtures installed after 1979. Thus, even some schools built after 1979 that have not undergone a complete lighting retrofit could have PCB-containing ballasts in their fluorescent light fixtures as well. To determine whether your school has PCB-containing ballasts, conduct a visual inspection of the ballasts in a representative number of light fixtures (not just the bulbs).

Figure 1 can help you determine whether there may be PCB-containing ballasts in your school. The ballasts are contained within the light fixture. Because you may need to remove the fixtures to view the ballasts, select a representative number of each type of fixture in use throughout the school to inspect first. Inspection may also be accomplished by removing a portion of the fixture, such as the metal panel covering the ballast. Expand your inspection if you find PCB ballasts. To prevent exposure if leaking ballasts are discovered, wear protective clothing, including chemically resistant gloves, boots, and disposable overalls. Make sure the survey is performed in a well-ventilated area, or provide supplemental ventilation or respiratory protection if necessary to reduce the potential for breathing in fumes. Be sure to keep a record of the areas (e.g., classroom 101) and location of the lights surveyed.

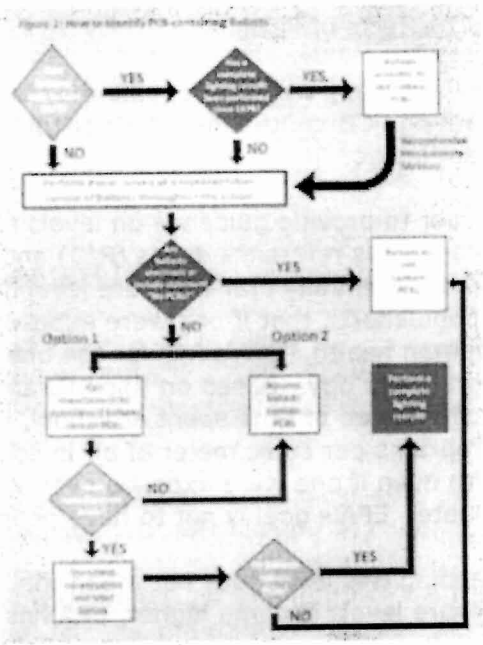


Figure 1: See larger image; use your browser's "Back" button to return to this page

If the ballasts do not have the statement "No PCBs," you have two options:

1. Assume that the ballasts contain PCBs,

   OR

2. Contact the manufacturer to determine whether the ballasts contain PCBs. If the manufacturer is not sure whether the ballasts contain PCBs, assume that they do.

What Should I Do if My Fluorescent Light Ballasts Contain PCBs?

Schools that have older ballasts should examine them to see if they have failed or if PCB leaks are present. If a light ballast is leaking PCBs, federal law requires the immediate removal and disposal of the ballast and disposal of any PCB-contaminated materials at an EPA-approved facility.

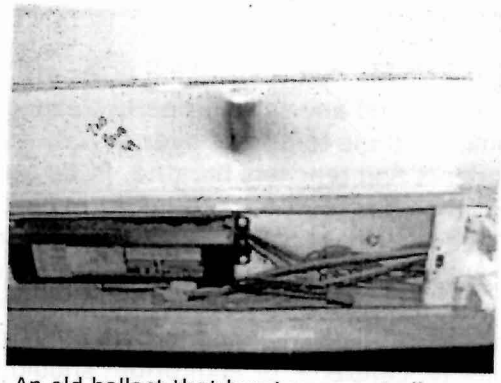
To eliminate the potential hazard posed by PCB-containing light ballasts in the most efficient manner, EPA recommends removing all PCB-containing ballasts (whether leaking or not). This can be done as part of a lighting retrofit which includes removing old fluorescent tubes as well as ballasts and replacing the entire lighting fixture with newer, more energy efficient fixtures. A complete lighting retrofit not only eliminates the hazard, it also increases energy efficiency. (See the Energy Star website for more detailed information.) It's an investment that pays off with long-lasting returns to your students, your community, and the environment.

Lighting retrofits to eliminate PCB-containing light ballasts should be considered as a component of any remodeling efforts.

Is It Really Necessary to Retrofit the PCB-Containing Fluorescent Light Ballasts in My School?

As PCB-containing light ballasts age, the chance that

they will leak or catch fire increases. This risk is compounded by the fact that there is often no way to detect whether ballasts are leaking or about to catch fire by simply looking at a light fixture. For example, one school found this out the hard way when a light ballast leaked PCB-containing oil over books, desks, and other school equipment. After EPA became aware of this incident, they examined other lighting fixtures in the school and found more leaking ballasts exposing students and staff to PCBs. During the inspection, EPA also learned that the school district was in the process of remodeling and upgrading light fixtures district wide.



An old ballast that burst unexpectedly.

Unaware that the old fixtures contained PCBs, the district had been taking them to another local school to be dismantled. The EPA discovered that the old fixtures were not being handled properly and that the leaking PCB ballasts were actually being stored on the school's playground. In addition, the workers handling the leaking ballasts were not trained in the proper handling of PCB waste materials. Lack of awareness of the problem and mishandling of the response needlessly exposed students, staff, and maintenance workers to PCBs.

Although a fluorescent lighting fixture retrofit might seem like a low educational priority in schools when compared with other priorities, school administrators should take into account this one school's example and what they might unexpectedly have to address if a ballast leaks or catches fire.

What Are the Risks and Potential Costs of Not Replacing the PCB-Containing Fluorescent Light Ballasts in My School?

A ballast leak or fire could happen at any time, without warning. A leak or fire may pose health issues for the staff or students who are exposed, and every release of PCBs from the ballast constitutes an unauthorized disposal of PCBs.

Where a ballast is leaking, significant costs could be incurred to cover, at a minimum:

- Relocation of students and teachers from the affected area into temporary quarters during cleanup and decontamination which may disrupt school programs and functions;
- Hiring properly trained and qualified cleanup personnel;
- Cleanup and decontamination of contaminated equipment and surfaces;
- Analytical testing of contaminated equipment and surfaces for PCBs;
- Compliance with environmental regulations for proper storage and disposal of contaminated equipment and cleanup materials;
- Retesting of equipment and surfaces to ensure that they are free of PCBs and other contaminants; and
- Replacement of leaking or burned fixtures and any other contaminated materials.

Postponing a lighting retrofit and betting on the structural integrity of old ballasts may result in health and educational impacts for your students and staff and serious cost impacts for your budget.

Are Students and Teachers in Danger if There are Leaking PCB-Containing Light Ballasts in Their School?

Light ballasts that are leaking PCBs are in violation of the law and should be immediately removed and any spills properly cleaned up. Where they remain in place, leaking ballasts could continue to off gas over several years, generating elevated levels of PCBs in air that students and teachers breathe. PCBs are persistent, bioaccumlative pollutants. This means that they are most harmful when exposure accumulates over a prolonged period of time. Since the risk of harm increases with increased exposure, the best protection is to remove leaking ballasts immediately. Steps should be taken so children and teachers do not continually spend time in an environment with elevated PCB levels in their air. While students and teachers do not need to be evacuated from the building, the affected area, classroom, hallway, cafeteria, or auditorium should be off-limits during cleanup and decontamination. Until the area is declared "clean" for use again, the school would need to find appropriate temporary quarters in the building for students and staff.

What Are the Special Procedures for Cleanup and Decontamination after a Ballast Leak or Fire?

Detailed cleanup and decontamination procedures for a leak, including management and disposal of wastes from PCB-containing ballasts, are outlined on EPA's PCB laws and regulations page. Due to the hazards associated with PCBs, an experienced contractor should be retained. The procedures for cleaning up and decontaminating after a fire are essentially the same as after a leak. However, after a fire, there may be other hazards or cleanup requirements not addressed in this document.

Federal law requires removal and disposal of leaking PCB-containing ballasts and disposal of any PCB-contaminated materials at an EPA-approved facility. For a list of approved facilities, please call the TSCA information hotline at (202) 554-1404, or refer to EPA's PCB website.

How Do I Retrofit the PCB-Containing Fluorescent Light Ballasts in My School?

An experienced contractor or staff should perform the lighting retrofit. Suggested responsibilities include:

- Disconnecting all power to and de-energizing all electrical equipment to be retrofitted under the supervision of a licensed electrician;
- Once you have determined you likely have PCB-containing light ballasts, inspecting all fluorescent light fixtures to determine if each individual ballast should be assumed to contain PCBs or is potentially leaking;
- Disconnecting and removing all ballasts, incidental PCB-contaminated items, and fluorescent tubes from the lighting fixture housings and compartments;
- Providing the appropriate containers and packing materials for packaging and storing the four possible types of waste streams:
  - Intact, non-leaking, PCB-containing ballasts;
  - Leaking PCB-containing ballasts and cleanup wastes generated by handling and decontaminating areas where leaking ballasts were discovered;
  - Ballasts that contain no PCBs; and
  - Fluorescent light bulbs.
- Maintaining a record for each area (e.g., classroom, hallway) where lighting fixtures are removed including how many leaking vs. non-leaking PCB-containing ballasts were removed from each area;
- Maintaining a record for each drum used to store PCB-containing ballasts including:
  - The number of ballasts in the drum;
  - The condition of the ballasts - leaking or non-leaking;
  - The date the first ballasts were placed in the drum;
  - The destination of the ballasts;
  - The name of the contractor packing the drum; and

- The name and address of the waste generator (e.g., the school's name).
- Packaging and labeling the drums according to federal, state, and local regulations;
- Storing the drums according to federal, state, and local regulations until a transporter currently licensed for transportation of PCB waste removes them to the appropriate disposal facility for each type of waste stream;
- Preparing manifests and other related documentation for the removal, transportation, storage, and disposal of PCB wastes and ensuring submittal to appropriate authorities;
- Handling any federal, state, and local recordkeeping or reporting requirements.

What Type of Waste Will Be Associated with a Retrofit and How Do I Handle It?

Different types of waste, both PCB and non-PCB, will be produced during a school lighting retrofit or if you are addressing leaking ballasts. Specific notification, packing, reporting, storage, transportation and disposal requirements are necessary for the four types of wastes. It is critical to check with state solid and hazardous waste agencies to ensure that wastes are handled properly. Some states have adopted stricter requirements than Federal regulations. Contact your state hazardous waste program for information on the rules that apply in your area. Get more information on TSCA disposal requirements for fluorescent light ballasts (PDF) (1 pg, 8K, about PDF).

Also, in conducting a retrofit, fluorescent bulbs, many containing mercury, will be present. Like the ballasts, ensure that the bulbs themselves are managed to avoid breaking them and releasing additional contaminants into the environment. More information on fluorescent bulb disposal requirements may be obtained from your state solid and hazardous waste agencies.

Schools also should be aware that, as generators of PCB-containing ballast wastes, they are responsible under federal law for ensuring the proper disposal of PCB waste.

What Are the Cost Savings Associated with a Retrofit?

Replacement of existing PCB-containing lighting fixtures with new high efficiency lighting will result in energy cost savings that will repay the investment in new lighting. The cost of replacing these fixtures can typically be recouped in less than seven years depending upon hours of operation and local energy costs. Detailed information on the savings that may be achieved through an investment in new lighting is available at the Energy Star website.

The Energy Star website also provides information about funding that may be available for the replacement of old fixtures.

What if a Retrofit Is Not Feasible in My Current Budget?

In most states there are several agencies with funding available to support energy-efficiency projects such as lighting retrofits. There are a number of ways to obtain financial assistance for making a building more energy efficient, with some programs covering conversion to more energy efficient lighting. Additionally, many states, localities, and utility companies have programs for energy efficiency rebates and other benefits that sometimes include converting to more energy efficient lighting. You may access your state's individual programs at the Department of Energy's (DOE's) Database of State Incentives for Renewables and Efficiency (DSIRE) EXIT Disclaimer . In addition, both public utilities and private energy companies may offer such programs. Programs may include technical assistance, rebates, or other funding assistance to support lighting upgrade projects. Contact your local energy provider or state energy commission for more information.

Specific programs to consider for assistance include:

Energy Star Program -- Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy and supports schools, businesses, and organizations in installing energy-efficient lighting technologies. The program offers assistance through workshops and information services that can be accessed from the Internet. These include: Lighting Upgrade Technologies; Financing Your Upgrades; New Building Design Guidance; and Service and Product Providers. These materials are available at the Energy Star website.

State Programs -- Many states provide additional incentives for lighting retrofits. Check with your state energy commission or with your local utility for more information.

Energy Providers -- Both public utilities and private energy companies may offer programs to support energy efficiency improvements such as lighting upgrades. Programs may include technical assistance, rebates, or other funding assistance to support lighting upgrade projects. Contact your local energy provider for more information.